Everyone in the world seems to think that going to a natural history museum is a good thing to do, but few people have the same idea of exactly what benefit they are supposed to get from their museum visit. During our visit to the National Museum of Natural History (abbreviated NMNH), we not only want to study and enjoy the exhibits, but also to start thinking about the following questions:

• What kind of information should the public displays of natural history museums communicate?
• To what age group, or groups, should their displays be pitched?
• Should all visitors expect simply to be able to admire interesting objects, or should they expect to be educated in the museum?
• Should a museum education involve any kind of effort on the visitor’s part?
• How can displays be designed that foster education without making the visitor feel that they are being made to work on their day off?

Museology, the art and science of operating a museum, involves a balance of several factors: the need to collect and curate significant specimens; the fostering of scientific studies of the collection, both by the staff of the museum and by visiting researchers; and the presentation of these collections and scientific results to the general public. Different curators and exhibit designers will have their own particular philosophies on the presentation of these specimens and interpretations. Additionally, exhibitions and the philosophy behind their design may change over time to reflect changes in societal values, information technology, and (of course) the increase in scientific knowledge. Our exercise today is to examine the results of some of these different approaches.

We will be focusing on the various paleontology, zoology, and geology halls of the NMNH. There are plenty of other good exhibits here, but it would take many days to examine them all in detail. As you go through the museum, remember that the heart and soul of a museum display is that interesting authentic objects be intelligently interpreted. Above all, watch other visitors to the museum and see how they interact with the displays. Have fun.
LOGISTICS

Each group is required to do four different galleries/halls in the Part I section of the packet, as well as the Part II-Synthesis at the end. You can choose from the following options (the letters correspond those to the map on the end of this packet):

PALEONTOLOGY – all on First Floor. [Each group must choose two (2) of the selections below.]

A. The Precambrian and Early life
B. Life in the Paleozoic Era (three sets of exhibits in two different galleries)
C. The invasion of the land
D. Early "reptiles" and the Hall of Dinosaurs (includes the Mezzanine)
E. Life in the Ancient Seas
F. The Hall of Fossil Mammals
G. The Hall of Ice Age Mammals

ZOÖLOGY [Each group must choose one (1) of the selections below.]

H. The Kenneth E. Behring Family Hall of Mammals – First Floor
I. Osteology: the Hall of Bones – Second Floor

GEOLOGY: Janet Annenberg Hooker Hall of Geology, Gems, and Minerals – Second Floor. [Each group must go to the following.]

J. The formation of Earth, Earth-structure, and meteorites

NOTE! Often, objects are removed from display or interactive exhibits are not working. If you can’t find the display, get Merck, Holtz, or Leone to show you where it is. If it really IS missing (often indicated by a “Specimen Temporarily Removed from Display” sign), or the interactive exhibit is not operational, please indicate this fact in your answer.

PART I – The Exhibits

A. The Precambrian and Early life – First Floor

1. What major fundamental environmental change to the Earth’s atmosphere is attributable to the action of Precambrian microbes? Are there any specimens present in the display that testify to that change? If so, describe them (i.e., what are they and how do they show evidence of this change?)
2. Check out the diorama of the Ediacaran life and environment. Note that the information presented about the Ediacaran animals comes from the late 1970s. At that time, it was assumed that the animals were representatives of animal groups that have living or well-known fossil representatives, such as jellyfish, segmented worms, or sea-pens. More recently, some paleontologists have proposed that they represent an earlier radiation of multicellular life that has no living descendants. The debate still rages. Do you think that the NMNH should be conveying this information in its display? If so, how might a display be designed that could be easily updated to show new information?

3. Watch the cartoon on the origin of life, played in the amphitheatre at various intervals. Is it effective (i.e., do you find it easy to understand)? Is it TOO simple?

Do you find the music and graphics effective or distracting? What about when you are outside the theater looking at other parts of the display? Explain.

Watch other visitors as they view the video. In the space of five minutes, how many people enter the video area? How many sit through the entire video?

4. Admire the large mural of the Precambrian landscape. Do you feel that it helps you to imagine what the landscape was like? Do you actually enjoy studying it, or does it affect you no more than wallpaper would?
B. Life in the Paleozoic Era – First Floor
(Note: To answer these questions, you will need to examine three separate exhibits. The display of the Paleozoic life that you encounter as you enter the central (dinosaur) hall is the first. The Burgess Shale specimens and dioramas (facing the interior of the Hall of Dinosaurs) was the second of these. Finally, the end of the Hall of the Ancient Seas closest to the Rotunda is the third Paleozoic life exhibit.)

1. The first Paleozoic life exhibit is broken down into a series of displays covering major animal groups. Generally speaking, do you think each display gives you a good idea of what distinguishes its animals from others? Do you think you could directly identify their distinguishing characteristics of one of these groups if you were given the specimens, based on the information they provide? Why or why not?

2. Look at the dioramas. Do you feel that they compliment the specimen displays well? Are the identities of the organisms in the dioramas clear? Can you find the actual fossils of these species on display in this exhibit?

3. Study the Burgess Shale display: a pair of exhibit cases and a central diorama. These are truly outstandingly unique and wonderful fossils. From what geological Period and what geographic location do they come?

What attribute of Burgess Shale fossils makes them particularly useful to science?
4. Locate and admire the specimens, illustrations, and diorama figures of the real Burgess Shale weirdoes, including *Hallucigenia, Opabinia, Aysheaia*, and *Marella*. Which of these three presentations (the actual specimens; the accompanying line-drawing illustrations; or the diorama models) do you find most effective in showing you what the animals were like? Explain.

5. Incidentally, the interpretation of *Hallucigenia* is literally upside-down and backwards compared to our current understanding. The “spiky legs” are in fact spikes on its back! Given this new interpretation, which of the three presentations (specimens, illustrations, or diorama figurines) is best at showing what is actually known about the animal?

6. Move over to the Hall of the Ancient Seas, and admire the big Paleozoic reef diorama. Take it from us: this thing is wonderful! Each little model is a life-sized reconstruction of an actual fossil taxon from the late Paleozoic. (Incidentally, the spiky coiled cephalopod *Cooperoceras* (the ELT mascot, on the logo on our website) is represented by both fossils and a life reconstruction in this exhibit!). Overall, the display approximates the environment of a sponge-brachiopod reef fringing the shores of the shallow seas that occupied west Texas during the Permian Period. Are all of the species shown in the diorama clearly identified? Can you find the actual fossils of the species on display?

If you hadn’t been given the information above, would you have realized that a specific historical environment was being portrayed?
C. The invasion of the land – First Floor

1. Watch the video display of the “Silurian Broadcasting Company” cartoon next to the diorama of scorpions and eurypterids. What were the major problems and hazards to animals in the colonization on land?

What do you think were the major advantages?

Watch how non-ELT visitors react to the video. Does it catch the attention of children? Adults? Do you, as an adult, feel that its message is complicated, straightforward, or so simple as to be boring?

How do you think an eight year old would answer?

Does the video dovetail nicely with the diorama, or are they disconnected?

3. Move to the circular room, and look at the displays on the invasion of the land by plants. In terms of artistry and professionalism of design, how do they compare with the other displays? How might they be improved?

Move into the next chamber. This room serves double-duty, discussing the paleontology of two groups that (in Rodney Dangerfield’s immortal worlds) “don’t get no respect”: plants and amphibians.
4. Find the skeleton of *Eryops*. From the fossil and the text description, can you describe something about its probable way of life? If so, do so. If not, explain why not.

Note the specimen labeled “*Pelosaurus laticeps*” in this display. Does the exhibit explain the possible relationship between *Eryops* and *Pelosaurus*? What is that relationship?

5. Find the case (on the floor) of specimens of the amphibian *Buettneria perfecta*. Why is the exhibit arranged this way? What aspect of the fossils and their discovery does this display show?

6. One wall has a number of specimens of various sorts of fossil plants. Find one of the specimens of *Cycadeoidea marylandica*. According to the labels, what geologic time was this fossil from, and where was it found?

D. Early "reptiles" and the Hall of Dinosaurs – First Floor, with a Mezzanine

1. Examine the skeletal mounts of *Dimetrodon, Edaphosaurus, Cotylorhynchus, Lystrosaurus, Dicynodon*, and *Aulacephalodon* in the “Stem Reptile” alcove. The labels indicate that all of these creatures are “mammal-like reptiles.” Does the display say in what way they resemble mammals? Do you see any obvious similarities between these creatures and mammals that aren’t also in reptiles like lizards, dinosaurs, or crocodilians?
2. From the material presented, do you have a clear idea when *Dimetrodon, Edaphosaurus, Cotylorhynchus, Lystrosaurus, Dicynodon,* and *Aulacephalodon* lived relative to each other? Relative to the dinosaurs? Relative to our time? If not, give a suggestion of a way that would make it easier to understand this.

3. Move to the main Hall of Dinosaurs. The skeleton of *Diplodocus* dominates the center island. Follow its whip-like tail to its tip. Most paleontologists now recognize that sauropods like *Diplodocus* (and indeed dinosaurs in general) held their tails off the ground, not dragging behind them. Pretend you are a museum director, given a choice between remounting this tail in the “modern” position (and thus giving an up-to-date restoration) or leaving it as it is. What factors would weigh in coming to your decision? What would you chose? If you choose to leave it in place, how might you convey to the public the modern scientific understanding of the tail position?

4. See if you can find the skeletons of the tyrant dinosaur *Albertosaurus* (tyrannosaurid specialists like Dr. Holtz now recognize that this REALLY a skeleton of *Gorgosaurus*) and the duckbill dinosaur *Edmontosaurus.* Where is the sign that identifies and discusses them? (There IS one, but it takes some finding....) How useful are these displays to visitors? To scientists?

One of these dinosaurs is mounted in “life position” (as if the animal were standing and its flesh were vaporized); the other is in “death position” (the way the bones were found in the ground). Which is mounted in which position? Do you think that the two skeletons should have been mounted together in this fashion? Why or why not?
5. Find the section of the exhibit dedicated to *Triceratops* and its relatives. This is a VERY recent addition to this hall, installed in 2001. What types of information is conveyed by this exhibit that is not shown in the other displays in the Dinosaur Hall?

Is this information effectively conveyed?

What advantages might there be in doing piece-meal renovations of museum halls (as done here and the newly re-mounted *Stegosaurus*) as opposed to the wholesale renovation of halls (as has been done for the modern mammal and is being done for the modern sea life halls)? What disadvantages are there for the piece-meal renovations?

[If Dr. Holtz is in the Dinosaur Hall while you’re there, ask him to point out some of the unusual features on the *Allosaurus* skeleton…]

**E. Life in the Ancient Seas – First Floor**

1. Admire the mural by Eleanor Kish. As one scans it from left to right, what sort of sequence do the animals appear in? How can you tell?

2. Did you notice that all of the major groups in the mural correspond to specimens in the display in front of it? Does this help you interpret the specimens?

How effective would the display have been without the mural?
3. Opposite the mural display are several smaller displays. Pick one, write down its name, and critique it. What is its primary message? How well is it conveyed? Are the specimens interpreted so that they make sense? How does this small display fit into the overall theme of the hall?

4. Find the video monitor showing the little claymation video of the extinctions of foraminiferans (shelled plankton), ammonoids (coiled squid-relatives), and mosasours (marine lizards). What extinction scenario is shown: i.e., what is the cause of the extinction event; what creatures die; how are these deaths related to each other?

How much narration or on-screen text is used to convey this information?

With what target audience (or audiences) do you think this display would be most effective?

Do you find the music contributes to this display, or do you find it distracting?
F. The Hall of Fossil Mammals – First Floor

1. Admire the Eocene exhibit and mural. Do the specimens in the display correspond to critters portrayed in the mural?

What method did the exhibit designers use to allow you to associate the specimens and the mural images? Is this easy or difficult to use?

2. The Eocene mural shows a scene from Wyoming. In what ways does Eocene Wyoming seem different from today’s “Cowboy State”?

3. Admire the Oligocene display and mural. How had the climate and vegetation of North America changed since the (geologically older) Eocene?

4. In the old Paleozoic life halls, and in the fossil vertebrate halls at the American Museum of Natural History, the displays are organized around taxonomic groups and relationships. In contrast, what is the overall plan for the Hall of Fossil Mammals?

What kind of information is being indicated in each display to distinguish it from the previous or next display?

Do you find this an effective approach?
5. Dinosaur paleontology has its “superstars”: *Tyrannosaurus*, *Stegosaurus*, *Triceratops*, *Velociraptor*, etc. Mammal paleontology does, too, but they’re not “A-list stars” like the dinosaur taxa. The Smithsonian exhibits have some of the best displays of these famous fossil Tertiary (pre-Ice Age) mammals, and we would be slacking if we didn’t have you pay attention to some of them. So, here’s a list of critters to look for. For each, give a short description of it:

*Hyracotherium* (entrance to Hall of Fossil Mammals):

*Uintatherium* (Eocene):

*Diatryma* (okay, a bird, not a mammal!; Eocene):

*Smilodectes* (Eocene):

*Archaeotherium* (Oligocene):

*Brontotherium* (Oligocene):

*Merycoidodon* (Oligocene):

*Palaeocastor* (Miocene: at the end of its burrow):

*Moropus* (Miocene):

*Teleoceras* (late Miocene-Pliocene):

*Stegomastodon* (late Miocene-Pliocene):
G. The Hall of Ice Age Mammals – First Floor

1. As you enter from the Hall of Fossil Mammals, you see a mural showing a Pleistocene lakeside scene. What animals in the mural would you not expect to run into in the wilds of North America today?

2. As you enter the main room there is a cluster of mammals from South America that migrated into North America on your left. Two fossil species are particularly impressive. Identify the following:

   The giant herbivore, able to walk on all fours or rise up on its backside to feed:

   The giant armored tank-like herbivore:

Both these species would have been present when the first humans arrived in the New World.

3. On the right hand side are skeletons of numerous fossil North American Ice Age mammals. The two biggest are the mammoth (Mammuthus) and the mastodon (Mammut). Based on the display, what are the differences between the two?

In Asia and Africa today elephants have a profound effect on the landscape, because they often pull down trees to feed on them. This feeding behavior opens dense forest up into savannahs and parkland. Do you think North American forests of the Pleistocene (before the arrival of Paleoindian hunters) might have differed from those of 500 years ago? If so, in what way?

What other mammal in this hall might have similarly altered the landscape in pre-human North America?
4. Find and briefly describe the following Ice Age Americans:

*Smilodon:*

*Canis dirus:*

*Teratornis:*

*Castoroides:*

*Arctodus:*

5. As you leave, study the human evolution display. What method has been used to update this display with new information? How might you design a display to deal with this problem more elegantly?

**H. The Kenneth E. Behring Family Hall of Mammals**

This is one of the newest gallery at the National Museum of Natural History: it just opened in late November, 2003.

1. What type of specimen is the primary focus of the mammal hall? (That is, what things are used to display mammals?)

2. In the Paleontology halls, some displays are organized around taxonomic groups and some organized around chronology. How is the primary information in the Behring Hall broken down between different chambers?

Within chambers?
3. The designers of this exhibit have spared no effort to make it appealing to children. Make a list of at least three design features especially aimed at capturing the attention of children. (Merck counts at least five spread through the various rooms.)

4. Give two examples of ways in which paleontological (fossil) information has usefully been incorporated into the display.

5. View the Mammal Family Reunion video. To what age group does it appeal? What major biological concept does it strive to convey?

Is it effective?

Does it take on any popular misconceptions about evolution? If so, which?

I. Osteology: the Hall of Bones – Second Floor
For a true challenge in museum exhibit design, proceed to Osteology: the Hall of Bones on the second floor. This exhibit dates from the mid-20th century. Take it from us; the specimens are a real treasure house of information to a trained observer. The problem is making it accessible to the average visitor.

1. In the mammal osteology hall (the first large chamber you enter), read the plaques describing major mammalian groups.

Would these plaques work just as well next to taxidermied specimens or living animals as next to osteological specimens (i.e., skeletons)? That is to say, do the plaques discuss distinctive evolutionary novelties of the skeleton of that group of mammals?
Briefly describe how one might design an osteology display that actually highlighted the interesting osteological characters of these animals.

2. Recall from class that different related groups of organisms have the same basic body plan modified for different modes of life. In some cases the modification might involve the loss of body parts. Find the following mammals, and list the number of fingers on their hands, toes on their feet, and what mode of life their limbs are adapted to:

<table>
<thead>
<tr>
<th></th>
<th>Hand</th>
<th>Feet</th>
<th>Mode of Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proboscis monkey</td>
<td>Nasalis larvatus</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Tapir</td>
<td>Tapirus bairdi</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Giraffe</td>
<td>Giraffa camelopardalis</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Common zebra</td>
<td>Equus burchelli</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Gray whale</td>
<td>Eschrichtius robustus</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Samoan fruit bat</td>
<td>Pteropus samoensis</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

3. Move to the round chamber. This section details the structure and function of bones. Are these displays at a comparable level of sophistication to those in other halls? Are they more complex? More simple? Explain.

4. Move back to the chamber with bird skeletons. What is the organizing principle for the cases in this chamber? Give two examples of cases in this room.
5. Move on to the reptile skeletons. Find the skeleton of the Indian python *Python molurus*, and find the splint-like bones along its sides. These are actually the pelves (hips) of the snake, much reduced. Based on the position of these hips, are snakes mostly tail, mostly “trunk” (that is, body in front of the tail), or about equal parts tail and trunk?

Janet Annenberg Hooker Hall of Geology, Gems, and Minerals – Second Floor

There are a lot of great exhibits here. We want you to concentrate on the ones in the left hand and rear galleries, rather than the right hand (Mineral and Gems) gallery.

J. The formation of Earth, Earth-structure, and meteorites

1. As you enter, be sure to look at the little vial of stellar diamond dust. This is on the right side as you enter the left gallery, at the meteorite entrance. Merck considers it to be the neatest specimen in the museum. Where did the material come from, and how old is it?

2. Watch the video in the Plate Tectonics Theater. What is its major message?

   Is it effective in arousing the interest of ordinary visitors? (That is, do they stop and stay to watch?)

3. Ordinarily, a museum display consists of interesting authentic objects, intelligently displayed. The objects of interest in the plate tectonics hall, of course, are continent-sized and won’t fit in any museum. What sort of interesting objects have the exhibit designers substituted for actual specimens in many of their displays?
4. Examine some of the interactive displays in this section (Meteorites, Earth origins, Earth structure, etc.). Pick your two favorites. List them, and explain why they are your favorites?

Are they fun and easy to use?

Is their educational purpose content clear and do they get their points across?

At what age group or knowledge level are they pitched? Do they exclude anyone?

5. Check out the animated earthquake history maps. (The music of the plates.) Do you think they convey effectively the role of seismicity in the identification of plate boundaries? Is there a clear connection between these displays and the plate boundary displays elsewhere in the hall?

6. There are many non-interactive displays in this exhibit. How are they arranged? Find a case, and describe its theme: that is, what aspect of geology does it portray? How does it convey that information?
PART II – Synthesis

Instructions: Answer the following general questions about the museum galleries you’ve visited so far.

1. Generally speaking, every museum gallery is meant to have one major “take home” message. In some, this comes through more clearly than in others. What do you feel were the take-home messages of the galleries that you visited? List each gallery and the message.

2. Each gallery has its own distinctive style in its use of art, audio-visual aids, and computer monitors. Besides actual specimens, what were the primary display media of the galleries you visited? (List by gallery/hall)

Did they present interesting information?

Did they help organize the information in other parts of the displays?

3. How do you feel about the level at which information was pitched in your galleries? Was it too complex, boring, or intimidating? Was it presented so simply that it insulted you intelligence? Did it appeal to a wide or narrow range of backgrounds? (List by gallery).
SPECIAL NOTE
Finding some rest rooms can be tricky. On the ground floor they are at the Constitution Ave. entrance lobby. On the first floor they are in the north corners to the east as well as near the Ancient Seas hall. Second floor rest rooms are located only in the north-west corner near Western Cultures.